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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/823,105	04/13/2004	Shunsuke Kobayashi	CU-3682 RJS	4514

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LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
HON, SOW FUN	
ART UNIT	**PAPER NUMBER**
1772	

DATE MAILED: 12/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/823,105	Applicant(s) KOBAYASHI ET AL.	
	Examiner Sow-Fun Hon	Art Unit 1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Withdrawn Rejections

1. The 35 U.S.C. 112, 2^{nd} paragraph, 35 U.S.C. 102(b) and 35 U.S.C. 103(a) rejections of claims 1-12, are withdrawn due to Applicant's amendment dated 09/07/06.

New Rejections

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 6,376,029) in view of Smith (US 5,932,309).

Regarding claim 1, Suzuki teaches a liquid crystal-soluble particle comprising: a core comprising one particle (nucleus, column 2, lines 1-5); and a protective layer comprising liquid crystal molecules provided on its periphery (thin liquid crystal layer formed on the particle surface, column 2, lines 4-6). The particle comprising a core surrounded by the protective layer of liquid crystal molecules provided on the core's periphery is liquid crystal-soluble due to the outer protective layer of liquid crystal molecules. Suzuki teaches that the particle has a core diameter of 100 nm (0.1 μm, column 4, line 2), the dimension of which makes it a nanoparticle as defined by Applicant's specification (original claim 2), wherein the particle selectively reflects light

of a specific wavelength, such as colored light (column 1, lines 20-26). Suzuki fails to teach that the particle has a core having a diameter smaller than 100 nm.

However, Smith teaches that the average particle size can be from about 10 nm or even less (0.01 microns or even less, column 7, lines 55-65), so as to be small enough to effectively reflect light chromatically (scatter, column 7, lines 42-45), for the purpose of providing the desired colored light.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used a particle with a core of less than 100 nm, as the liquid crystal-soluble particle of Suzuki, in order to provide the desired colored light, as taught by Smith.

3. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Smith, as applied to claim 1 above, and further in view of Kobayashi (US 4,701,024).

Suzuki in view of Smith, teaches a liquid-crystal soluble particle, comprising a core surrounded by the protective layer of liquid crystal molecules provided on the nanoparticle core's periphery, wherein the core has a diameter smaller than 100 nm, as discussed above. Suzuki in view of Smith, fails to disclose the value of the short axis width of the liquid crystal molecule, and hence fails to teach that the short axis width of the liquid crystal molecule is equal to or less than the diameter of the nanoparticle core.

However, Kobayashi teaches a core metal particle, wherein liquid crystal molecules are oriented vertical to the surface of the core metal particle (magnetic, column 3, lines 35-36, 52-55), and the length of liquid crystal molecule is 5 nm (50

angstroms, column 3, lines 55-59), which means that the short axis width of the liquid crystal molecule is equal to or less than 5 nm, and is less than the diameter of the core metal particle (length of particle is about 200 nm, or 0.2 μm, column 3, lines 55-56), for the purpose of uniformly and stably dispersing the plural core metal particles in ordinary liquid crystal media (column 3, lines 42-45).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used liquid crystal wherein the short axis width of the liquid crystal molecule is equal to or less than the diameter of the core particle for the liquid crystal-soluble particle of Suzuki in view of Smith, in order to uniformly and stably disperse the plural core particles in the liquid crystal medium, as taught by Kobayashi.

4. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Smith, as applied to claim 1 above, and further in view of Won (US 6,712,997).

Suzuki in view of Smith, teaches a liquid-crystal soluble particle, comprising a core surrounded by the protective layer of liquid crystal molecules provided on the nanoparticle core's periphery, wherein the core has a diameter smaller than 100 nm, as discussed above. In addition, Suzuki teaches the core comprises one metal particle (nucleus, column 2, lines 1-5, metals, column 4, line 1).

Regarding claim 4, Suzuki in view of Smith, fails to teach a method of manufacturing the liquid-crystal-soluble particle by reducing a plurality of metal ions in a solution containing liquid crystal molecules or liquid crystal-like molecules.

However, Won teaches a method for manufacturing a matrix-soluble particle (dispersed on a molecular level, column 2, lines 47-50) comprising: a core comprising one or a plurality of metal nanoparticles (composite polymers containing nanometer-sized metal particles in a well-dispersed state in the polymer matrix, column 2, lines 30-34) wherein a plurality of metal ions (Ag+ ClO4-, column 7, lines 30-35) are reduced (column 2, lines 50-53) in a solution containing the matrix molecules (POZ, column 7, lines 30-35) to allow the matrix molecules to bond to the periphery of the metal nanoparticle (fixing, column 2, lines 50-53), for the purpose of providing nanometer-sized particles (column 2, lines 35-40).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the method of manufacturing of Won to form the liquid-crystal-soluble particle of Suzuki in view of Smith, wherein a plurality of metal ions are reduced in a solution containing liquid crystal molecules, to allow the liquid crystal molecules to bond to the periphery of the metal nanoparticle formed, in order to provide a liquid crystal-soluble particle which is nanometer-sized, as taught by Won.

Regarding claims 5-6, Suzuki in view of Smith, fails to disclose the species of metals, let alone that the metal ion precursor is chosen from at last one metal salt among metal halides, metal perhalogenates and metal nitrates.

However, Won teaches that the metal nanoparticle is made of at least one kind of metal atom selected from Ag, Pd, Au, Pt, Cu, Fe, Co and Ni (intermetallic, binary alloy, ternary alloy, column 3, lines 15-18), for the purpose of utilizing the physical properties of the specific metal species. Won teaches that the metal ion is chosen from at last one

metal salt among metal halides ($FeCl_2$, column 10, lines 3-5), metal perhalogenates ($AgClO_4$, column 7, line 33) and metal nitrates ($AgNO_3$, column 7, lines 20).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have formed the metal nanoparticle of Suzuki in view of Smith, from at least one kind of metal atom selected from Ag, Pd, Au, Pt, Cu, Fe, Co and Ni, wherein the metal ion precursor is chosen from at last one metal salt among metal halides, metal perhalogenates and metal nitrates, in order to utilize the physical properties of the specific metal species, as taught by Won.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Smith, as applied to claim 1 above, and further in view of Kobayashi (US 4,701,024) and Asano (US 4,909,605).

Suzuki in view of Smith, teaches a liquid-crystal soluble particle, comprising a core surrounded by the protective layer of liquid crystal molecules provided on the nanoparticle core's periphery, wherein the core has a diameter smaller than 100 nm, as discussed above. In addition, Suzuki teaches that the core comprises one metal particle (nucleus, column 2, lines 1-5, metals, column 4, line 1), and that the liquid-crystal soluble particle selectively reflects light of a specific wavelength, such as colored light (column 1, lines 20-26). Suzuki in view of Smith, fails to teach a liquid crystal device comprising a pair of parallel substrates, conductive layers provided respectively on facing inner surfaces of these substrates, liquid crystal alignment layers provided respectively with pre-tilt angle on facing inner surfaces of these conductive layers, and a liquid crystal layer formed in between these pair of liquid crystal alignment layers,

wherein the liquid crystal-soluble particles are dissolved or dispersed in the liquid crystal layer.

However, Kobayashi teaches a liquid crystal device element shown in Fig. 2A (cell, column 4, lines 30-34) comprising: a pair of parallel substrates (transparent plates 5, 6, column 4, lines 34-35); conductive layers provided respectively on facing inner surfaces of these substrates (electrodes 7 and 8 on the inner surfaces, column 4, lines 34-37); and a liquid crystal layer formed in between (liquid crystal molecules 3, column 4, lines 36-38). Kobayashi fails to teach that the liquid crystal layer is formed in between a pair of liquid crystal alignment layers formed on the facing inner surfaces of the pair of conductive layers, wherein the alignment layers are provided respectively with a pre-tilt angle.

However, Asano teaches a liquid crystal display device element wherein the liquid crystal layer is aligned between a pair of liquid crystal alignment layers (pair of substrates each having an alignment layer, column 2, lines 43-47), and wherein the liquid crystal alignment layers are provided respectively with a pre-tilt angle (column 3, lines 1-2), for the purpose of providing a pre-tilt angle to the liquid crystal (column 5, lines 43-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have formed the liquid crystal layer in between a pair of liquid crystal alignment layers formed on the facing inner surfaces of the pair of conductive layers in the liquid crystal device element of Kobayashi, wherein the liquid

crystal alignment layers are provided respectively with a pre-tilt angle, in order to provide the desired pre-tilt angle to the liquid crystal, as taught by Asano.

In addition, Kobayashi teaches that metal particles (column 4, lines 66-68) are dispersed in the liquid crystal (column 6, lines 37-40), to provide the liquid crystal with an effective switching function (column 5, lines 35-42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the liquid crystal-soluble particles comprising metal nanoparticle cores of Suzuki in view of Smith, as the metal particles dispersed in the liquid crystal layer of the liquid crystal device element of Kobayashi in view of Asano, in order to allow good dissolution or dispersion of the metal particles in the liquid crystal layer, and to provide the liquid crystal layer with selective light reflection, such as colored light, as taught by Suzuki in view of Smith, as well as an effective switching function, as taught by Kobayashi.

6. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Smith, Kobayashi and Asano, as applied to claims 1, 7 above, and further in view of McKnight (US 6,304,239).

Regarding claims 8-10, Suzuki in view of Smith, Kobayashi and Asano, teaches the liquid crystal device element as discussed above. In addition, Kobayashi teaches that the liquid crystal device element has a control circuit for applying voltage (Fig. 2A, circuit 27, column 7, lines 25-30, Fig. 12). Suzuki in view of Smith, Kobayashi and Asano, fails to teach that the control circuit for applying voltage, modulates at least the frequency among the parameters of frequency and voltage, and is provided on the

conductive layer, for varying light transmittance of the liquid crystal layer, wherein under a constant applied voltage, an electro-optical response is turned on by switching the frequency of the applied electric field from low frequency to high frequency, and the electro-optical response is turned off by switching the frequency from high frequency to low frequency, let alone that the frequency modulation range is in a range of 20 Hz to 100 kHz.

However, McKnight teaches a liquid crystal device element (column 1, lines 18-24), wherein a control circuit for applying voltage, while modulating frequency (control voltage is modulated with a high frequency oscillation, column 15, lines 6-10), is provided on the conductive layer (electrode, column 15, lines 6-8) for the purpose of varying light transmittance of the liquid crystal layer (crossover frequency from positive dielectric anisotropy to negative dielectric anisotropy, column 15, lines 10-14), and under a constant applied voltage, an electro-optical response is turned on by switching the frequency of the applied electric field from low frequency to high frequency (crossover frequency from positive dielectric anisotropy to negative dielectric anisotropy, column 15, lines 10-14), and the electro-optical response is turned off by switching the frequency from high frequency to low frequency (dual frequency electro-optical liquid crystal, column 15, lines 29-33). McKnight teaches that the frequency modulation range of the electro-optical response is for example, in a range of 5 kHz to 100 kHz (column 15, lines 9-10), which is within the claimed range of 20 Hz to 100 kHz. McKnight teaches that the duration of frequency modulation can be from a fraction of a ms to over 1.0 ms (column 14, lines 1-7), which means that a time constant of response concerning

turning the electro-optical response on and off is in a range of a fraction of a ms to over 1.0 ms, which overlaps the claimed range of 0.1 ms to 10 ms. McKnight teaches that these voltage control parameters provide good display characteristics, which include color purity, high contrast, high brightness, and a fast response (column 1, lines 26-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the voltage control parameters of McKnight, as the voltage control parameters of the control circuit in the liquid crystal device element of Suzuki in view of Smith, Kobayashi and Asano, in order to provide the desired liquid crystal display characteristics of color purity, high contrast, high brightness, and a fast response, as taught by McKnight.

Regarding claim 11, Suzuki in view of Smith, Kobayashi and Asano, teaches a metal nanoparticle constituting the liquid crystal-soluble particle, as discussed above. In addition, Kobayashi teaches that the metal particle is at least one kind of metal atom selected from Fe (column 4, lines 66-68).

Regarding claim 12, Suzuki in view of Smith, Kobayashi and Asano, fails to teach a method of driving the liquid crystal device element by using an active matrix mode.

However, McKnight teaches that one method of driving the liquid crystal device element is by using an active matrix mode (column 26, lines 6-13), for the purpose of utilizing the driving characteristics of the specific mode.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used an active matrix mode as a method of driving the liquid crystal device element of Suzuki in view of Smith, Kobayashi and

Asano, in order to utilize the driving characteristics of the active matrix, as taught by McKnight.

Response to Arguments

7. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection. However, Applicant's arguments regarding the valid use of Suzuki are addressed below to advance prosecution.

8. Applicant argues that in order to form the arrangement of Suzuki stably, it is easily assumed that the liquid crystal molecules must be constrained parallel to the core surface by having the length of the molecule long axis equal to or shorter than the core fine particle diameter and enlarging the contact area between the liquid crystal molecules and core surface to generate an electrical interaction on the core surface, suggested by the very fact that Suzuki restricts the size of the core fine particle to the range of 0.1 to 5,000, preferably 0.3 to 500 microns, wherein it is difficult to arrange the long axis orientation of the cholesteric liquid crystal parallel to the core fine particle if the core fine particle diameter is smaller than 100 microns, and that therefore the effect characteristic to the invention of Suzuki cannot be achieved with the core fine particle having a diameter smaller than 100 microns.

Applicant is respectfully apprised that Applicant has not provided clear comparative data demonstrating that the above assumption is true. The arguments of Counsel cannot take the place of evidence in the record. See MPEP 716.01(c) and MPEP 2143.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number is (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached at (571)272-1498. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Hon.
Sow-Fun Hon
11/27/04

Rena Dye
RENA DYE
SUPERVISORY PATENT EXAMINER
Technology Center 1700
11/27/04